RPGR gene

retinitis pigmentosa GTPase regulator

Normal Function

The *RPGR* gene provides instructions for making a protein that is essential for normal vision. Although the protein's function is not well understood, studies suggest that it plays an important role in cell structures called cilia. Cilia are microscopic, finger-like projections that stick out from the surface of many types of cells. They are involved in cell movement and many different chemical signaling pathways. Cilia are also necessary for the perception of sensory input, including hearing, smell, and vision.

Several different versions (isoforms) of the RPGR protein are produced from the *RPGR* gene. One version contains a segment known as the ORF15 exon. This version of the RPGR protein is active (expressed) predominantly in the retina, which is the light-sensitive tissue at the back of the eye. Specifically, the ORF15-containing isoform is found in the retina's specialized light receptor cells (photoreceptors). Researchers suspect that this isoform may help maintain photoreceptors by regulating the function of cilia. Other isoforms of the RPGR protein are expressed in other parts of the body, where they are probably also involved in cilia function.

Health Conditions Related to Genetic Changes

cone-rod dystrophy

primary ciliary dyskinesia

retinitis pigmentosa

More than 300 mutations in the *RPGR* gene have been found to cause the X-linked form of retinitis pigmentosa. This condition primarily affects males, causing night blindness in early childhood followed by progressive daytime vision loss. *RPGR* gene mutations account for about 70 percent of all cases of X-linked retinitis pigmentosa.

Most of the mutations responsible for X-linked retinitis pigmentosa occur in the ORF15 exon of the RPGR protein. These mutations usually result in an abnormally short, malfunctioning protein. Changes in the structure of the RPGR protein likely disrupt the normal function of cilia in photoreceptor cells. However, it is unclear how these changes lead to the gradual loss of photoreceptors and resulting vision problems that are characteristic of retinitis pigmentosa.

other disorders

Although most *RPGR* gene mutations cause X-linked retinitis pigmentosa, a few mutations in the ORF15 exon have been found in people with other retinal disorders. These include cone-rod dystrophy, cone dystrophy, and atrophic macular degeneration. These retinal disorders are characterized by progressive vision abnormalities, although their signs and symptoms are distinct from retinitis pigmentosa.

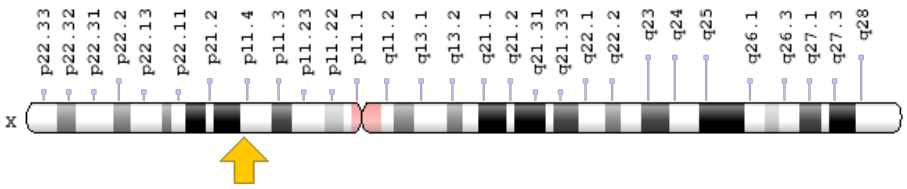
Several additional *RPGR* gene mutations have been reported in people with a combination of retinitis pigmentosa and signs and symptoms affecting other parts of the body. In addition to progressive vision loss, affected individuals have had chronic respiratory and sinus infections, recurrent ear infections (otitis media), and hearing loss.

It is unclear why mutations in the *RPGR* gene can cause a variety of disorders. Studies suggest that certain mutations may disrupt the function of cilia in multiple tissues, including the inner ear and respiratory tract. Malfunctioning cilia in these tissues may underlie the hearing loss and respiratory abnormalities seen in some affected individuals. However, researchers are still working to determine how *RPGR* gene mutations cause specific abnormalities involving the retina and other parts of the body.

Chromosomal Location

Cytogenetic Location: Xp11.4, which is the short (p) arm of the X chromosome at position 11.4

Molecular Location: base pairs 38,269,163 to 38,327,564 on the X chromosome (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- COD1
- CORDX1
- CRD

- PCDX
- retinitis pigmentosa 3 GTPase regulator
- retinitis pigmentosa 15
- RP3
- RP15
- RPGR_HUMAN
- X-linked retinitis pigmentosa GTPase regulator
- XLRP3

Additional Information & Resources

Educational Resources

- Molecular Cell Biology (first edition, 2000): Cilia and Flagella: Structure and Movement
  https://www.ncbi.nlm.nih.gov/books/NBK21698/

GeneReviews

- Nonsyndromic Retinitis Pigmentosa Overview
  https://www.ncbi.nlm.nih.gov/books/NBK1417

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28RPGR%5BTIAB%5D%29+OR+%28retinitis+pigmentosa+GTPase+regulator%5BTIAB%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+1800+days%22%5Bdp%5D

OMIM

- CONE-ROD DYSTROPHY, X-LINKED, 1
  http://omim.org/entry/304020
- RETINITIS PIGMENTOSA GTPase REGULATOR
  http://omim.org/entry/312610
- RETINITIS PIGMENTOSA, X-LINKED, AND SINORESPIRATORY INFECTIONS, WITH OR WITHOUT DEAFNESS
  http://omim.org/entry/300455

Research Resources

- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=RPGR%5Bgene%5D
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=10295
- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/6103
- RetNet: Summaries of Genes and Loci Causing Retinal Diseases
  https://sph.uth.edu/retnet/sum-dis.htm
- RPGR Gene Mutation Database
  http://rpgr.hgu.mrc.ac.uk/
- UniProt
  http://www.uniprot.org/uniprot/Q92834

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